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ABSTRACT

Incarcerated females are an under-studied population with little published research on weight changes or obesity. A sample of 98 female inmates, at a Federal Bureau of Prisons complex, was used in this comparative descriptive study of weight, body mass index (BMI), changes among inmates in different custody level institutions, and with different sentence lengths. Data were collected by record reviews retrospectively over a three-year period and the length of incarceration. This study is based on Roy's Adaptation Model. The total sample was heavier on admission than the general public. The sample shifted from normal to overweight individuals while the percentage of obese inmates showed small fluctuations. The mean BMI increase for the three-year period was statistically significant ($t = 2.05$, $p = 0.04$). The period of incarceration, which covered a longer time and had less missing data, produced results with greater statistical significance than the three-year period ($t = 2.91$, $p = 0.004$). In-custody inmates gained weight and had a significant mean BMI increase ($t = 2.05$, $p = 0.05$), while out-custody inmates experienced a non-significant BMI increase ($t = 0.90$, $p = 0.38$). Independent t-tests comparing BMI changes by custody level were not significant ($t = 0.96$, $p = 0.34$). Inmates with shorter sentences (<100 months) had a non-significant mean decrease in BMI ($t = 0.04$, $p = 0.97$), while inmates with longer sentences (≥ 100 months) had a significant mean increase in BMI ($t = 2.52$, $p = 0.02$). Independent t-tests comparing the BMI changes by sentence length yielded $t = 1.13$, $p = 0.26$ for 1996-1998, and $t = 2.06$, $p = 0.05$ for the length of incarceration. Inmate BMIs by age followed the trends experienced by the general public, but BMIs by ethnicity did not.

Keywords: **incarceration, inmate, female, weight, obesity**

CHANGES IN WEIGHT EXPERIENCED BY FEMALE INMATES
IN THE FEDERAL BUREAU OF PRISONS

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THESIS

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PREFACE

This research was conducted to describe weight changes among female inmates over longer periods of incarceration. This research helped to identify groups at risk for the complications associated with overweight and obesity, and to guide further research and interventions.

DEDICATION AND ACKNOWLEDGEMENT

To my husband, Paul, and to my friends and classmates, I dedicate the creation of this thesis. Without their support, encouragement, and flexibility this program and thesis would not have been completed. I would like to acknowledge my associates in the Federal Bureau of Prisons who helped smooth the way for my research: Harriet Lebiwitz, Dr. Gregg, Warden Bogan, and Penny Coppola.

TABLE OF CONTENTS

PREFACE	viii
DEDICATION AND ACKNOWLEDGEMENTSix
LIST OF TABLES.....	.xiii
LIST OF FIGURES.....	xiv
CHAPTER I: INTRODUCTION.....	1
Background of the Problem.....	1
Significance.....	5
Purpose Statement.....	6
Research Questions.....	7
Hypotheses.....	8
Variables.....	8
Conceptual Framework.....	9
Definitions.....	10
Limitations and Assumptions.....	12
Summary.....	14
CHAPTER II: REVIEW OF THE LITERATURE.....	15
Introduction	15
Weight and Female Inmates.....	15
Weight, Female Inmates, and Structured Environment.....	18
Longer Sentences and Male and Female Inmates.....	18
Weight and Female College Freshmen.....	21

Summary	22
CHAPTER III: METHODOLOGY.	24
Introduction.	24
Research Design/Sample.	24
Sample	24
Data Collection Form	25
Protection of Human Subjects.	25
Summary	26
CHAPTER IV: DATA ANALYSIS.	27
Introduction	27
Sample Selection.	27
Description of Sample.	28
Results of Body Mass Index (BMI) Changes.	29
Total Sample.	29
Sample by Custody Levels.	31
Sample by Length of Sentence.	36
Summary	42
CHAPTER V: SUMMARY.	44
Conclusions.	44
Total Sample Compared to General Public.	47
Study Groups Compared to General Public by Ethnicity.	53
Recommendations.	61

Implications.	62
REFERENCES.	64
BIBLIOGRAPHY	68
APPENDICES	69
Appendix A	Security Classification for Female Inmates
Appendix B	Custody Level Classification for Female Inmates
Appendix C	Letter from C. J. Durkee, Chief, Budget Executive Branch, BOP
Appendix D	Data Collection Form
Appendix E	USUHS IRB Approval Letter
Appendix F	BOP Institution Approval Memorandum
Appendix G	BOP Regional Office Approval Memorandum
Appendix H	BOP Central Office Approval Memorandum

LIST OF TABLES

Table 1. BMIs of Sample Inmates on Admission, 1996 and 1998	31
Table 2. BMIs of Sample Inmates by Custody Levels on Admission, 1996 and 1998	33
Table 3. BMIs of Sample Inmates by Length of Sentence on Admission, 1996 and 1998	42
Table 4. BMIs of Sample Inmates on Admission, 1996 and 1998 Compared with the General Public	48
Table 5. Combined Overweight and Obesity Classifications (BMI ≥ 25) by Age for Sample Inmates on Admission, 1996 and 1998 Compared with the General Public	49
Table 6. BMIs of Sample Inmates by Race/Ethnicity on Admission, 1996 and 1998 Compared with the General Public	52
Table 7. BMIs of Out-custody Inmates by Race/Ethnicity on Admission, 1996 and 1998	55
Table 8. BMIs of In-custody Inmates by Race/Ethnicity on Admission, 1996 and 1998	57
Table 9. BMIs of Inmates with Shorter Sentences by Race/Ethnicity on Admission, in 1996 and 1998	59
Table 10. BMIs of Inmates with Longer Sentences by Race/Ethnicity on Admission, in 1996 and 1998	60

LIST OF FIGURES

Figure 1. Ethnicity of Total Sample.	29
Figure 2. Ethnicity of Out-Custody Sample	32
Figure 3. Ethnicity of In-Custody Sample	35
Figure 4. Ethnicity of Group Sentenced to 100 Months or More.	38
Figure 5. Ethnicity of Group Sentenced to Less Than 100 Months	40
Figure 6. Mean BMI Change During Incarceration by Decade of Life	50
Figure 7. Mean BMI Change During Incarceration by Ethnicity.	53

CHAPTER I: INTRODUCTION

Background of the Problem

Obesity is the second leading cause of preventable death in the United States.

Obesity is a risk factor for developing many serious health problems including hypertension, dyslipidemia, type II diabetes, coronary heart disease, stroke, gallbladder disease, osteoarthritis, sleep apnea, respiratory problems, and endometrial, breast, prostate and colon cancers (National Institute of Health [NIH], 1998). In addition to health problems, diseases related to obesity place a significant economic burden on society. Direct costs and loss of productivity due to obesity-associated conditions in the United States is estimated at \$78.8 billion yearly (Burton, Chen, Schultz, & Edington, 1998). Despite potential medical and economic consequences and extensive public education, obesity continues to be a problem. The percentage of overweight adults in the United States remained constant from 1971-1980 at 26% of males and 29% of females. The period 1988-1994, however, saw an increase in the percentages of overweight adults to 50% for males and 39% for females (Center for Disease Control and Prevention [CDC], 1998).

Multiple factors including genetics, environment, culture, and socioeconomic conditions all contribute to the complex condition of obesity (United States Public Health Service [USPHS], 1991). Environmental changes such as incarceration may have a significant impact on weight changes leading to obesity. Casual observation, while employed at a women's prison for three years, indicated that female inmates tended to gain weight after arriving at the institution. Shaw, Rutherford and Kenny (1985) studied weight gain of female inmates over a three-month period, and the jail's diet as a possible

contributor. Results of the study revealed that at the time of incarceration, 30.3% of the females were obese, three months later this figure increased to 48.5%, with an average weight gain of 14 pounds (Shaw et al., 1985).

Weight gain during incarceration was also addressed in a study by Fogel (1993), that examined stress and its long-term outcomes related to clinical depression, physical symptoms and weight gain. This study revealed that upon incarceration in a Federal facility, 44% of the women were obese, however after six months the percentage of obese inmates increased to 57%. Moreover, 17% of the women admitted within normal weight range were obese at the end of the study (Fogel, 1993). These studies indicated that short-term incarceration, whether by increasing stress or altering diet, was followed by weight gain.

Since 1988, the number of female, Federal Bureau of Prisons (BOP) inmates has increased by 182 %. As of December 31, 1977, female inmates in both state and Federal correctional facilities totaled 79,624 (U.S. Department of Justice [USDJ], 1998). As of May 1998, the BOP housed 7,512 females (Federal Bureau of Prisons [BOP], 1998a). If females gain weight after incarceration, this weight gain could adversely impact their health, quality of life in prison and after release, and contribute significantly to medical care costs.

Existing published research on weight gain among female inmates is limited. Previous research on female inmates assessed weight gain among female inmates as an indication of inadequate diet or stress over a short period of time, three to six months (Fogel, 1993; Shaw et al.). There have been no published studies in the United States assessing changes in weight over longer periods of incarceration; even though the

average sentence for Federal female inmates is 34 months for all offenses, 57.2 months for violent offenses, and 53.4 months for drug offenses (Bureau of Justice Statistics, 1998).

No published studies have described weight changes in inmates with different sentence lengths. Paulus and Dzindolet (1993) reported that inmates with longer sentences become increasingly negative and troublesome. Ruback, Carr, and Hooper (1986) reported that inmates with longer sentences were able to adjust to prison and had fewer problems. MacKenzie and Goodstein (1985) reported that male inmates with longer sentences had problems for the first three years and the difficulties decreased after the third year. These studies offer conflicting reports concerning the impact of sentence length on inmates.

No published studies describe inmate weight changes at different custody levels. Security level classification for female inmates is based on a classification score that reviews threat to public safety, severity of offense, length of sentence, and previous criminal history (see Appendix A). Custody level is based on security classification and used to assign the inmate to the initial institution (see Appendix B). Custody levels are reviewed and adjusted every 6 to 12 months (BOP, 1996).

In-custody inmates have an initial security designation of low, medium, high or administrative (BOP, 1996). In-custody inmates are assigned to an institution surrounded by two parallel fences, and armed perimeter patrols. Living units can be 'locked down', secured so that no one enters or leaves the unit unless the doors are opened by the correctional staff. Administration, records, food service, commissary, education, recreation, pastoral care, psychology, Federal Prison Industries and a secured visiting

area are all maintained within the perimeter fence (Sims, 1992). In-custody inmates are eligible for work assignments with supervision but may not work or attend programs outside the secure perimeter (BOP, 1996).

Out-custody inmates have a security level of minimum or low (BOP, 1996). These inmates are housed in camps without perimeter fences, armed perimeter guards or lockable housing units. Out-custody inmates may work outside the institution perimeter with intermittent supervision (BOP, 1996). Camps have buildings for administration, records, food service, commissary, education, recreation, Federal Prison Industries, pastoral care, psychology, and an open visiting area (Sims, 1992). The greater number of out-custody institutions allow inmates to be incarcerated closer to their families which results in more frequent visitation (Sims, 1992).

Sims (1992), a case manager at a Federal female prison complex, wrote a descriptive article on her experience working at a camp (out-custody) and a medium/high security unit (in-custody). Sims' view of inmates housed at in-custody and out-custody institutions and on sentence length is summarized in the following quotation.

As every experienced prison administrator knows, there are pronounced differences between minimum and medium/high security inmates. This certainly holds true for female inmates. Obviously, these differences directly correlate to the length of the inmate's sentence, and seem to affect the development of trust in staff-inmate relations. (p. 48)

Sims (1992) noted that female inmates with different sentence lengths and custody level are different, and age, previous criminal history, or number of family visits could

influence the difference. However, this view of female inmates was based on observation and the perceived truths of correctional workers, no research was cited in this article.

Significance

Research providing additional information about the inmates grouped by sentence length and custody level could help guide further study and aid in development of appropriate and group-specific interventions.

If this study identifies weight gain as a problem, it would provide a basis for additional studies to define barriers to weight maintenance or loss, and to develop interventions to promote weight loss and improve health among incarcerated women. Inmates with longer sentences and different custody levels may have different levels of obesity and require different interventions. Weight loss need not be large in order to have an impact on the health of inmates. Studies show that a weight loss of as little as 10 to 20 pounds can decrease the harmful effects of obesity (National Institute of Diabetes and Digestive and Kidney Disease [NIDDKD], 1998). Decreasing weight could improve the health of the individual by lowering blood pressure, improving dyslipidemia, and preventing or improving control of blood sugar levels in type II diabetics (National Heart, Lung, and Blood Institute [NHLBI], 1998a). Controlling these risk factors could decrease cardiovascular disease, stroke and the complications of diabetes (NHLBI, 1998a). Weight loss could also improve self-esteem and decrease the discrimination in employment, housing, job earnings as well as increase opportunities for further education and marriage (NHLBI, 1998a). Failing to control the above complications could adversely influence the inmate's ability to care for self, to work, or to care for others.

Preventing the complications of obesity could possibly ease the inmate's transition back into society, allowing them to resume family roles and to enter the work force.

Weight loss could also improve overall health, decreasing the cost of health care, medications and hospitalizations while incarcerated and after release. C. J. Durkee, Chief, Budget Executive Branch, Bureau of Prisons (personal communication, May 3, 1999, see Appendix C) provided information on the cost of incarcerating female inmates and allowed for the following calculations. The average cost per female inmate per day in various security-level, non-medical institutions is \$55.44. The average cost per inmate per day in a BOP medical institution is \$103.02 (includes male and female costs combined, separate costs for female inmates are not available for BOP medical institutions). These findings suggest that incarceration in a BOP medical facility costs the government an average of \$17,506.70 more per year, doubling the cost of incarceration in a non-medical BOP facility.

"Incarcerated women are a forgotten group; the public and health care providers know little or nothing about their health problems" (Ingram-Fogel, 1991, p.56). Health promotion and disease prevention is the current focus for health care. Nurses, working with this challenging and under-served population, should welcome research-based information, guidance, and interventions.

Purpose Statement

Obesity has been associated with multiple health problems and high costs to the individual, health care system, and society. Environmental changes may impact weight and lead to obesity. Incarceration is a significant change in environment and research on long-term incarceration and weight changes is limited. The purpose of this comparative

descriptive study was to assess weight changes, as measured by BMI changes, among Federal female inmates over a three-year period of incarceration. Body mass index (BMI) changes were described and compared for inmates with shorter (less than 100 months) and longer (100 months or more) sentences, and for inmates incarcerated at out-custody and in-custody level institutions.

Research Questions

The limited research on incarceration and weight changes in female inmates left some questions unanswered. The following questions were addressed in this study.

1. To what degree does weight, determined by BMI, change for female inmates in the Federal Bureau of Prisons?
2. To what extent does weight, determined by BMI, change for female inmates incarcerated in an out-custody institution?
3. To what extent does weight, determined by BMI, change for female inmates incarcerated in an in-custody institution?
4. Is there a difference in BMI changes of female inmates at out-custody institutions compared to in-custody institutions?
5. To what degree does weight, determined by BMI, change for female inmates with long sentences, 100 months or more?
6. To what degree does weight, determined by BMI, change for female inmates with shorter sentences, less than 100 months?
7. Is there a difference in BMI changes for female inmates with shorter sentences and female inmates with longer sentences?

Hypotheses

The research questions generated two hypotheses to be tested in this study.

1. Inmates will experience less increase in BMI at the out-custody institution than at the in-custody institution.
2. Inmates with shorter sentences will experience less increase in BMI than inmates with longer sentences.

Variables

1. The dependent variable will be weight change measured by BMI change.
2. The independent variables will be two different custody level institutions, in and out, and longer and shorter sentences.

This comparative descriptive study was designed to gather the data needed to answer the research questions and support or refute the hypotheses presented. This study of female inmates at a Federal prison complex in the southern United States included data elements of height, weight, age, ethnicity, custody level, and length of sentence. This data was obtained from the medical records as part of the admission assessment and yearly physical rather than relying on self-reports. "Comparisons of self-reported overweight data with actual measurements of height and weight show that people tend to underreport their weight. Therefore, the need for actual measurements of weights and heights to assess the prevalence of overweight takes on even greater importance" (USPHS, 1995, p. 31). Demographic findings were compiled and reported. Weight changes were determined by computing body mass index (BMI) for an individual and comparing changes in BMI retrospectively over a three-year period and over the period of incarceration. BMI changes were used to describe and compare inmates at in-custody

and out-custody institutions and inmates sentenced to less than 100 months and 100 months or more.

Conceptual Framework

Sister Callista Roy's Adaptation Model (Fawcett, 1984) provided conceptual orientation for identifying changes associated with incarceration. Roy's Adaptation Model is a holistic, nursing approach to an individual's response to an ever-changing environment and the stress it produces. Environment is defined to include both internal and external facets. Each person has four modes of adaptation: physiologic needs, self-concept, role function and interdependence relations (Roy & Roberts, 1981). Roy defines the nursing process as a problem solving procedure involving gathering data, identifying problems, selecting and implementing approaches, and evaluating the results (Fawcett, 1984). The Adaptation Model insists that the client be an active participant and ultimately responsible for his own destiny (Roy & Roberts, 1981).

Incarceration impacts three modes of adaptation. Although this study does not specifically assess self-esteem, roles or interdependence, these factors impact stress levels and behaviors, including weight gain, as noted in Fogel's (1993) article. Self-esteem may be altered by being a convicted felon and in prison. Roles are compromised as inmates are unable to fulfill their responsibilities as mothers, daughters, and significant others. For many, the role of inmate is unknown, scary territory. Interdependence is also altered as inmates lose autonomy and responsibility for themselves (Fogel, 1993). Suddenly the inmate is dependent on the BOP for all her needs: shelter, food, clothing, medical care, and work. The inmate's sense of self and the ability to control most aspects of her life are abruptly changed. Weight change, the focus of this study, could potentially be influenced

by maladaptive responses to changes in self-esteem, roles and interdependence caused by incarceration.

Roy's model lists gathering data as the first step in the nursing process (Fawcett, 1984). This study used objective measures to describe and compare the weight changes among female inmates incarcerated at a Federal prison complex in the southern United States and serves as a database for further research and testing of interventions.

Definitions

For the purpose of this study, the following terms were operationally and theoretically defined.

Age

Year of birth was collected from the medical record and verified by computer printout, allowing for computation of age.

Body Mass Index (BMI), or Quetelet's Index

BMI is a measure of weight adjusted for stature and "shows that highest correlation with independent measures of body fat" (Burton et al., 1998, p. 786). BMI is the most widely used measure of assessing body weight in large populations (Burton et al.). Morbidity, mortality and relative risk of cardiovascular disease correlates with BMI (NHLBI, 1998b). BMI was operationally defined as weight in kilograms divided by height in meters squared.

Bureau of Prisons (BOP)

Federal Bureau of Prisons, under the United States Department of Justice.

Female Inmate

Women currently incarcerated at in-custody and out-custody level BOP institutions.

In-Custody Level Institution

A correctional institution that provides a more secure environment for housing inmates. Inmates may work under supervision but must remain within the institution's secure perimeter (BOP, 1996). These institutions have units that lock, double fences topped with razor wire, and armed patrols outside the fences.

Length of Sentence

Amount of prison time, in months, designated by the court after the individual is found guilty.

Longer Sentence

A sentence length of 100 months or more given by the court. The average sentence for Federal females is 34 months. Some inmates are transferred to halfway houses as much as one year before release (Sims, 1992). Initially the arbitrary division of sentence lengths was proposed at 50 months. However, once the data were collected only one subject had a sentence of less than 50 months. Therefore, longer sentence was operationally defined as a sentence length of 100 months or more which allowed for an adequate sample size in both groups.

Obesity

Clinical Guidelines on the Identification, Evaluation, and Treatment of Overweight and Obese Adults, (NHLBI, 1998b), defines obesity as a BMI greater than or equal to 30

and overweight as a BMI of 25.0-29.9. Using these as operational definitions allowed study group findings to be compared to the general public.

Out-Custody Level Institution

A correctional institution that provides a less secure environment for housing inmates. Inmates may work outside the institution's perimeter with a minimum of two-hour intermittent staff supervision (BOP, 1997). These camps are without fences, towers, and usually without roving patrols. Inmates are required to work a job, and be in their rooms at specific times when a security count is done.

Shorter Sentence

A sentence length of less than 100 months given by the court. The average sentence for Federal females is 34 months. Some inmates are transferred to halfway houses as much as one year before release (Sims, 1992). Shorter sentence was operationally defined for this study as a of sentence length of less than 100 months.

Weight

Weight in pounds as recorded on admission physical and yearly health maintenance exam. When yearly health maintenance exams were not present, weight from the clinic visit closest to the maintenance exam anniversary and within the same calendar year was used. Height and weight were converted to BMI for the purpose of this study. The National Heart, Lung, and Blood Institute (1998a) recommends that BMI be used to assess changes in weight.

Limitations and Assumptions

This study was limited to female inmates who have been in the BOP at least three years and were assigned to one Federal prison complex in the southern United States at

the time of the study. Assuming that activity level and some medications can influence weight changes, non-ambulatory inmates and inmates taking steroids, tricyclic antidepressants, antipsychotics, lithium, carbamazepine, valproate, and cyproheptadine, were excluded (Hintlian, 1995; Wadden, 1995). Inmates that were pregnant during the three-year period or were diagnosed or treated for cancer were also excluded. Inmates that spent more than six weeks of the last three years in seclusion were excluded due to the limited opportunity to exercise and no access to commissary items (food and drinks available at the institution store). Data collection was limited to a record review and lacked information on genetic history and behaviors such as exercise level or smoking cessation.

In addition to limitations the following assumptions were made about this study. It was assumed that documentation on height and weight, needed to compute BMI, was available in medical records. The study assumed that the documentation of height and weight was measured and recorded accurately and consistently at each physical exam. It was also assumed that a change in BMI is the result of changes in adipose tissue, not muscle. The study assumed that the change in BMI is influenced by incarceration.

This study assessed weight change and obesity over an extended time, and weight changes in inmate populations that differ in custody level, and length of sentence. Although some latitude is allowed at the institutional level, the Federal Bureau of Prisons issues specific guidelines to regulate the relatively uniform operation of food service at its facilities (BOP, 1998b). However, generalization of this study should be limited to BOP institutions. The wide variances in state and local correctional institutions

compared to the BOP made it difficult to generalize these findings to all incarcerated females.

Summary

Obesity is a costly problem for the individual, the health care system, and the nation. Studies have shown that incarcerated females gain considerable weight over the first three to six months. The BOP often keeps inmates longer than six months. There is no published data on the weight of female inmates over longer periods of time. This study described weight (BMI) changes in female inmates over a three-year period as well as for the period of incarceration, and compared weight changes for inmates with different sentence lengths and custody levels. Comparisons of BMI between the sample and the general public by age and ethnicity were done. This descriptive study clarified existing problems and provided the groundwork for further study.

CHAPTER II: REVIEW OF THE LITERATURE

Introduction

This chapter is a review of the limited published research on weight changes among female inmates. The literature reviewed includes articles that address weight, as a measure of stress or inadequate diet, among female inmates in United States institutions, and an article addressing weight and female inmates in an extremely structured Japanese prison environment. The literature review also covers studies assessing the effect of longer sentences on male and female inmates, but not addressing weight specifically. No published articles were found comparing the weight changes in institutions with different custody levels and subsequently different degrees of structure. The literature review was expanded to include articles on weight gain in female college freshmen, and weight changes in different structured environments.

Weight and Female Inmates

Limited published studies were found on weight changes of incarcerated women. Shaw et al. (1985) conducted a study of 56 female inmates weight in an east-coast city jail for three months. The study consisted of predominately black, poor female inmates with pre-existing health problems, and incarceration from 1 to 50 weeks. The 1959 Metropolitan Life Insurance Actuarial Table was used to determine underweight, overweight, and normal weight. Data collection included measuring height and weight and dietary analysis of a menu (analysis type not indicated). On admission 30.3% of the women were found to be obese (20% or more above weight norm). Three months later, 91% had gained weight and 48.5% were obese. The average weight gain was fourteen pounds. The authors estimated that female inmates consumed a daily excess of 250

calories, by either increasing food or decreasing activity. Evaluation of the New York City jail's diet, which was not the location for the weight study, indicated that 3133 calories were served per day. Further dietary analysis indicated that the diet was calorie rich and nutrient poor. The study went on to discuss stress and medication side effects contributing to weight gain, and increased illness rate, caused by poor health, incarceration and poor nutrition. The data collection for this study was not done at the same institution or on the same sample. Weights were collected at one institution; the diet evaluation and percentage of tray eaten at another institution; and health problems from a previous study at yet a different prison. No statistical tests were presented.

Ingram-Fogel (1991) found similar results in her six-month study of 135 female inmates in a maximum-security prison located in a Southern state. General demographics were single, head of household, non-white, in their twenties, low education level, unemployed or employed in an unskilled job prior to incarceration, and serving 2-55 year sentences. Only 55 completed the weights, questionnaires, and tests required in this study. Attrition was primarily due to transfer or early release. Demographic differences between the subjects lost to attrition and those completing the study were evaluated. The significant differences were the increased size of nonwhite group ($p = 0.03$), and a longer mean length of sentence ($p = 0.0001$). The purpose of this study was to describe and document the physical and psychological health problems of incarcerated females. Data were collected from medical charts, physical exam forms, lab work and a health history interview form completed by the researcher. Psychological health status was measured by the Center for Epidemiologic Studies Depression Scale ($\alpha = 0.92$), the State Trait Anxiety Scale for Measuring State Anxiety ($\alpha = 0.92$), and the Present Tense Health

Opinion Study ($r = 0.78$). Subjects did not perceive themselves as unhealthy but reported numerous health problems. Obesity was defined as weighting 20% or more over the midpoint of weight for height. The table used to determine weight for height was not named. Subjects were found to be depressed (66%), to have high levels of distress, and to have high anxiety levels (70%). On admission, 45% of the inmates were overweight, by six months it had increased to 57%. Seventeen percent of the subjects who were normal weight on admission were obese at six months. The average weight gain was 14 pounds over the six-month study. Other health care problems noted in this study included gynecological problems (72.7%), pain (72.7%), dermatological problems (62.8%), and gastrointestinal disturbances (61.7%) reported on clinic visits. The number of health care visits ranged from 0-12 to see physicians, and 0-23 to see physician extenders. Interestingly, less than 2% of the subjects was hypertensive.

The suggestion that incarcerated women bring to prison numerous health problems has been substantiated. Further the prison experience did not improve the health of this sample of incarcerated women even though they had access to health care services. It is important however to acknowledge that six months in prison did not improve or maintain the health of these subjects from their perception and to recognize the stressful nature of the prison environment. (Ingram-Fogel, 1991, p. 55)

Both studies, Shaw et al. (1985), and Ingram-Fogel (1991), addressed female inmates and weight, but used weight gain as an indication of inadequate diet, increased stress, and other physical and psychological factors over short periods of time. Neither article looked at weight changes as a specific health problem and risk factor. These

studies reported that short-term incarceration at in-custody institutions was followed by weight gain.

Weight, Female Inmates, and Structured Environment

Contrasting findings were reported in a Japanese study of female inmates in a very structured and strictly controlled environment. Nara and Igarashi (1997) studied the effects of a prison-labor lifestyle on serum lipids, blood pressure, and weight, as measured by BMI, in 400 female inmates in a Japanese prison over one year. Conditions were tightly controlled. Inmates worked in a factory seven hours a day, had mandatory daily walks, ate 1800 kcal/day, and did not have access to cigarettes, alcohol, hard drugs, or hormone replacement therapy. Inmates were split into two groups, pre-menopausal ($m = 312$) and post-menopausal ($m = 88$). All serum lipids decreased, except HDL (high-density lipoproteins), which increased. Blood pressure decreased and BMI decreased by 13% in the pre-menopausal group and 6.4% in the post-menopausal group. The post-menopausal group was less responsive to the changes in life style. It is unclear if this is due to hormone levels, the aging process, or some other factor.

This study contradicts the previous studies as all subjects lost weight. This study closely controlled diet and activity levels with positive results in contrast to the studies by Shaw et al. (1985) and Ingram-Fogel (1991). However, several of the conditions, such as limited food, no cigarettes and mandatory exercise, imposed in Japan would be viewed as violating inmates' rights and probably not be allowed in BOP correctional facilities.

Longer Sentences and Male and Female Inmates

In addition to weight, several studies have looked at effects of incarceration on the physiological and psychological homeostasis of male and female inmates. Paulus and

Dzindolet (1993) argued that the longer a person is incarcerated the more negative and troublesome they became. Another study (Ruback et al., 1986) proposed that the longer a person was in prison the fewer problems she has. A third article (MacKenzie & Goodstein, 1985) argued that longer sentences impacted male inmates greatest the first three years of the sentence.

Paulus and Dzindolet (1993) presented a model of prison adjustment stating the longer a person is incarcerated the more negative they become due to the deprivation of prison life, problems with staff or other inmates, and institutional programs and procedures. This model was supported by their four-month study of an equal number of male and female inmates ($n = 106$). Only 80 subjects, 40 male and 40 female, completed both assessments. The authors proposed shorter sentences and early releases as the cause of attrition. Subjects completed background data forms and a questionnaire for rating their environment, mood, depression, anxiety, social support, coping styles, problem scale, tolerance scale, physical symptoms, blood pressure and number of visits to the clinic. Reliability was addressed by summing scores of sets of items that covered similar issues. Several of the scales used had decreased reliability. The associated coefficient alpha reliabilities were below 70 on the first testing for the housing evaluation, prison evaluation, depression scale, and social problems in prison scale. The coefficient alpha reliabilities were below 70 on the first and second testing for the control scale, environmental problems in prison scale, and problems outside prison scale. Female inmates rated their housing more negatively, were more anxious and stressed, had lower systolic blood pressure and reported more physical problems. There was no reduction in chronic disease rates or physical complaints. Over time, social problems in prison

increased while problems outside decreased. Ratings of environment, anger, depression, anxiety, degree of control, tolerance of stressors and coping mechanisms did not change significantly over the four-month period. Outside support decreased causing a decrease in inmate satisfaction with it. Sense of control was the only measure significantly correlated with both physical symptoms and diastolic blood pressure (Paulus & Dzindolet, 1993).

Ruback and colleagues (1986), studied male prisoners at a small rural (n = 50) and large urban prison (n = 173). This study looked at sense of control related to opinion of living accommodations, stress level and physical symptoms. The study did not address weight changes, but it did report that the longer an inmate was incarcerated, the more familiar he became with his environment, reporting a greater sense of control and a decrease in stress, anxiety, blood pressure and illness.

MacKenzie and Goodstein (1985) studied offenders with long sentences (OLTs) with three years served, OLTs with greater than six years served, and offenders with shorter sentences. Written questionnaires were completed by 1270 male inmates at three maximum-security institutions. The subjects were 46% black, 42% white and 12% other. Average sentence was 12.5 years. Thirty-two percent had completed at least one year of high school and 59% had graduated from high school. Greater than half were from large cities. Questionnaires were administered on three separate visits separated by at least three months. Inmates completed a questionnaire only once. They found that OLTs with less than three years served reported more anxiety, depression, psychosomatic illnesses (problems with nerves, headaches, stomach cramps), fear of other inmates and lower self-esteem than the two other groups. This disagreement over the relationship of sentence

length to stress prompts questions about a relationship between length of sentence and weight changes.

These studies show that imprisonment has an adverse effect on the psychological and physiological functions of the body, which includes weight. There is little agreement on the relationship of length of sentence to the psychosocial problems and reported illnesses of inmates. No published research was found that looked at weight changes and length of sentence.

Weight and Female College Freshmen

A review of published literature yielded no studies of weight changes among inmates in different custody levels. Custody levels vary in structure, restrictions and environment. Freshmen college students' experience changes in environment and structure, and studies do exist on weight changes in female freshmen.

The "freshman 15" is the widespread belief that female freshmen gain 15 pounds that first year. Several studies have argued that it is a myth. Megel et al. (1994) found an average weight gain of 2.45 pounds. Hodge, Jackson, and Sullivan (1993), reported that, of the 61 freshmen finishing the study ($n = 110$), 32 remained the same weight, 18 gained weight and 11 lost weight. An average weight gain was 7 pounds for those that gained weight.

However, a study by Hovell, Mewborn, Randle, and Fowler-Johnson (1985) that looked at weight gain in female freshmen by living arrangements, in dormitories or off-campus, may provide insight into inmates, weight gain, and custody levels. Hovell et al. (1985) reported that individuals living in on-campus dorms and eating cafeteria food rapidly gained 8 pounds, while those living off-campus gained less than 1 pound. On-

campus obesity rate was 26%; the off-campus rate was 9%. Most freshmen moved off-campus into apartments or sororities for their sophomore year. The subjects' weight gain slowed and, by the end of the junior year, their weight returned to near baseline. The restrictive life style of a dormitory cannot be equated to prison, but some stressors and the controlled environment are similar. The differences between on-campus and off-campus living styles may indicate the differences between the very restrictive prison routine of the in-custody institutions and the much less structured environment of the out-custody camps.

Summary

The review of literature indicates that female inmates gain weight over the first three to six months. A Japanese study reported the opposite in a highly structured prison environment over one year. Changes in weight over longer periods of time were not studied. No research was found that addressed weight changes and length of sentence. While published studies presented conflicting results concerning the impact of sentence length on inmates, the studies reviewed all agreed that sentence length had an impact on inmates. No published studies were found on the weight changes experienced in the controlled environment of in-custody institutions and the less structured environment of out-custody camps. Research on female college freshmen reported weight gains, although one longer study reported weight gain among freshmen in the controlled dormitory environment, and loss of that weight when, as sophomores, they were allowed to move off campus. The purpose of this study was to describe weight changes in Federal female inmates over three years, and in relation to custody level and length of sentence.

The review of literature found voids that the answers to the research question in this study attempted to fill.

CHAPTER III: METHODOLOGY

Introduction

The purpose of this study was to describe body mass index, BMI (the ratio of weight in kilograms to the height in meters squared), from 1996 to 1998, as well as the period of incarceration among female inmates at a Bureau of Prisons (BOP) complex in the Southern United States. BMI changes for inmates with different sentence lengths, and custody levels were described and compared. This chapter covers: the research design and collection form used; the sample and exclusion criteria; and protection of human subjects and necessary approvals.

Research Design

This was a comparative descriptive study of weight changes, as measured by the body mass index (BMI), among Federal female inmates over a three-year period. "The comparative descriptive design examines and describes differences in variables in two or more groups that occur naturally in the setting" (Burns & Grove, 1997, p. 252). Changes in BMI were compared for inmates at in-custody and out-custody institutions and for inmates with shorter and longer sentences. All data were collected retrospectively from records. In addition to describing weight changes over time, this study provided demographic data on age, ethnicity, and length of incarceration.

Sample

A Federal female prison complex in the southern United States was chosen for convenience because it provided both the out-custody and the in-custody environments desired for comparison in this study. Data on 98 inmates meeting the criteria of the study were obtained from a review of the records. Inmates who had changed custody levels in

the past three years were excluded. Inmates assigned to the adjoining medical facility were excluded from this study because of their complex medical problems and medication regimes that impact weight and mobility. Inmates taking tricyclic antidepressants, phenothiazines or other psychotropic medications, lithium, glucocorticoids, carbamazepine, valproate, and cyproheptadine were excluded because significant weight gain is a potential side effect of these medications (Hintlian, 1995; Wadden, 1995). Inmates who were pregnant during the past three years were excluded. Inmates who spent more than six weeks in seclusion were excluded due to the limited opportunity to exercise and no access to commissary items. Inmates who had cancer or received chemotherapy during the time frame when data was collected were also excluded.

Data Collection Form

No existing form was found that met the data collection needs of this study. A form was developed by the researcher to record year of birth to compute age, ethnicity, month and year of incarceration, custody level, length of sentence, height, and weight yearly over a three-year period (see Appendix D). A pilot study conducted to test data collection procedures using this form resulted in an intrarater reliability of 100%. The same researcher collected all data. An individual experienced in both primary care and documentation procedures in the BOP has favorably reviewed the tool. Height and weights were used to calculate BMI, and BMI was used to compare weight changes.

Protection of Human Subjects

This study was completed strictly by record review. The researcher had no contact with inmates and performed no treatments or interventions. The study posed no

identifiable risks and informed consent was not necessary. The proposal was submitted to Uniformed Services University of Health Sciences (USUHS) Institutional Review Board (IRB) and approved per letter dated June 28, 1999 (see Appendix E). The proposal was approved by the prison complex IRB and the warden (see Appendix F), and by the BOP Regional Office (see Appendix G). Final approval from the Bureau of Prison's Central Office was received by memorandum dated November 15, 1999 (see Appendix H). The researcher assured confidentiality by assigning a sequential case number and not including identification data such as prisoner number, social security number, name, or full date of birth. The researcher collected only the data needed for this study.

Summary

The comparative descriptive design of this study and the form used were explained. The sample criteria and exclusions were defined. Protection of human subjects was addressed and necessary approvals documented. Data analysis relative to the sample, the research questions and the hypotheses are addressed in Chapter Four.

CHAPTER IV: DATA ANALYSIS

Introduction

The purpose of this study was to describe body mass index, BMI (the ratio of weight in kilograms to the height in meters squared), changes over a three-year period, as well as the period of incarceration, among female inmates at a Bureau of Prisons (BOP) complex in the Southern United States. BMI changes for inmates with different sentence lengths, and custody levels were described and compared. This chapter contains the process involved in sample selection and a description of the sample. Results of the data collection process are presented, analyzed, and compared using description, tables, and graphs.

Sample Selection

Obtaining a study population was accomplished by requesting a computer printout of all inmates with a date of offense prior to 1996. A separate printout was produced for in-custody and out-custody inmates. The printouts also included data on length of sentence, race, ethnicity, date of birth.

The in-custody printout contained 121 inmates, of these, 89 inmates met the study inclusion criteria. Nine inmates were excluded because they were not incarcerated for the entire three-year period, 1996-1998. Three inmates had a change in custody level, two were pregnant during the three-year period, 1996-1998, and 18 were on medications listed as exclusion criteria. A sample of 50 charts was obtained by selecting every other chart from those inmates who met the requirements.

The out-custody printout contained 91 inmates whose charts were available for review. Fourteen inmates were excluded because they were not incarcerated for the

entire three-year period, 1996-1998. Two inmates had a change in custody level, one had greater than six weeks in seclusion, three had cancer and chemotherapy during this period and 23 were on medications listed as exclusion requirements. The out-custody sample for the study consisted of the remaining 48 charts.

Description of Sample

A sample of 98 inmates meeting the criteria of the study was obtained: 48 out-custody and 50 in-custody. Twenty-six of the charts had one or more weights missing. Although annual exams are scheduled for all female inmates, they have the right to refuse any medical care. The age range for the sample inmates was 22 to 72 years with a mean age of 40 years. Ethnicity is almost equally divided between white, black and Hispanic (see Figure 1). The length of sentence ranged from 48 months to life in prison, with a mean sentence length of 151 months or 12.6 years, excluding the three life sentences. Length of time served in prison as of 1998 ranged from 3 to 13 years, with a mean time of 5.3 years or 64 months. The height of sample members ranged from 58 to 71 inches, with a mean height of 64 inches. Initially obesity was to be defined as a BMI greater than or equal to 27.3. However, Clinical Guidelines on the Identification, Evaluation, and Treatment of Overweight and Obese Adults (NHLBI, 1998b), defined underweight as BMI less than 18.5, normal weight as BMI of 18.5 to 24.9, overweight as BMI 25.0-29.9, and obesity as a BMI greater than or equal to 30. Using these weight categories allowed for specific comparisons between sample groups and the general public.

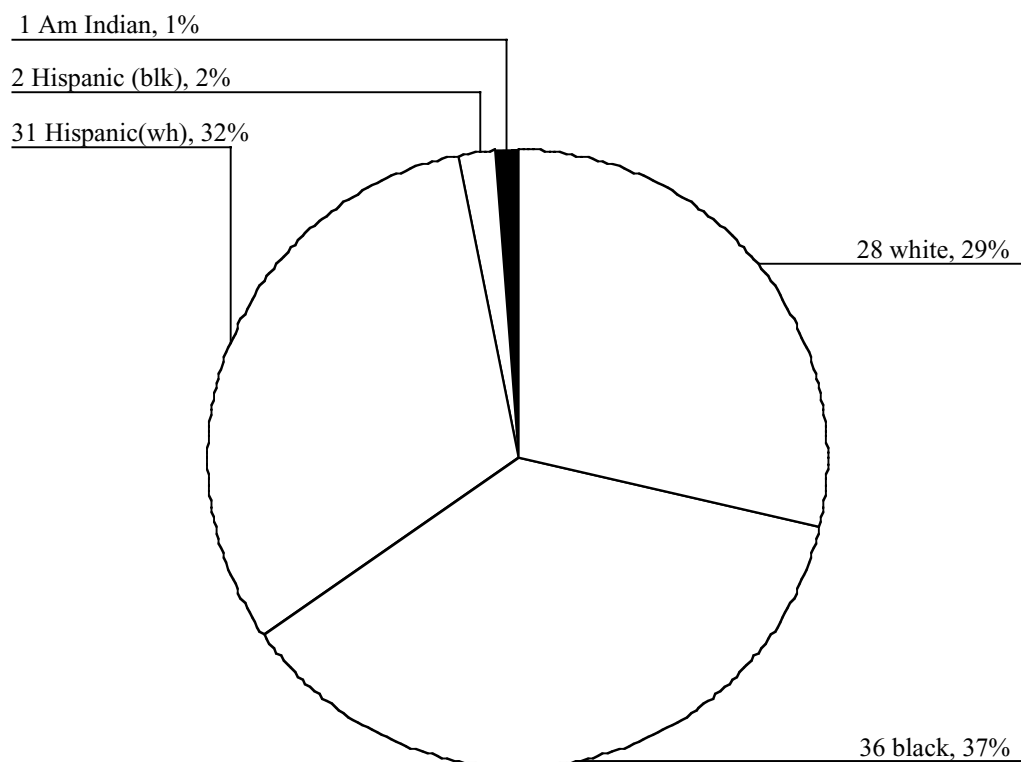


Figure 1.

Ethnicity of Total Sample.

Results Body Mass Index (BMI) Changes

Total Sample

Admission BMIs, for the 98 sample inmates, ranged from 18.6 to 49.8, with a mean BMI of 28.1 (see Table 1). The BMIs in 1996, for the 82 inmates with weights recorded (16 charts lacked weights for 1996), showed a slight increase which continued through 1998. On admission no inmate was underweight, 42 inmates were normal weight, 24 were overweight and 32 were obese. The percentage of normal weight inmates

progressively decreased 12 percent over the period of incarceration. The percentage of overweight individuals steadily increased 11 percent, and the percentage of obese remained fairly stable, increasing only one percent (see Table 1).

Results for Three-Year Period

Fifty-two of the 82 inmates gained weight which resulted in a mean increase in BMI of 1.5 (8.9 pounds) from 1996-1998. Twenty-six inmates lost weight resulting in a mean decrease in BMI of 1.7 (9.6 pounds), three had no change in BMI, and 17 charts had missing data and could not be evaluated. The percentage of normal weight inmates decreased, with the bulk of the increase seen in the overweight classification (see Table 1). The changes in BMI ranged from a decrease of 6.1 to an increase of 5.0 with a mean increase of .5. The mean 1996 BMIs were compared to the 1998 BMIs using a paired t-test ($t = 2.05$) with a confidence interval of 95% and yielded a significance of 0.04.

Results for Period of Incarceration

Sixty-two of 97 inmates show a mean increase in BMI of 2.3 (13 pounds) over the length of incarceration, 31 inmates showed a mean decrease in BMI of 2.0 (11.6 pounds), four had no change in BMI, and one chart had missing data and could not be evaluated. The percentage of inmates with normal weight decreased by 12 percent (see Table 1). The admission BMIs were compared to the mean 1998 BMIs using a paired t-test ($t = 2.91$), the resulting significance level was 0.004, highly significant.

Table 1.**BMI's of Sample Inmates on Admission, 1996 and 1998.**

	Admission	1996	1998
<u>n</u>	98	82 ¹	97 ²
BMI range	18.6-49.8	18.6-49.9	20.7-52.5
BMI mean	28.1	28.8	28.9
<u>Number (Percent)</u>			
Underweight	0	0	0
Normal weight	42 (43%)	30 (37%)	30 (31%)
Overweight	24 (24%)	23 (28%)	34 (35%)
Obese	32 (33%)	29 (35%)	33 (34%)

¹ Sixteen charts had missing weights for 1996.

² One chart had the weight missing for 1998.

Sample by Custody LevelsOut-Custody Sample

The out-custody sample consisted of 48 inmates. Ethnic breakdown had a smaller percentage of Hispanics and larger percentages of whites and blacks (see Figure 2). Ages ranged from 25 to 72 years with a mean of 41.9 years. Length of sentence ranged from 51 to 365 months with a mean of 144 months (12 years). Length of incarceration ranged from 3 to 11 years with a mean of 5.8 years (70 months). Out-custody inmates had admission BMIs ranging from 18.6 to 49.8 with a mean of 28.0 (see Table 2). The mean

BMI increased over a three-year period and length of incarceration. Out-custody inmates had 44 percent normal weight individuals on admission, and steadily decreased for a total loss of six percent. The percentage of overweight and obese individuals fluctuated during incarceration with both reporting a net increase of four percent in 1998.

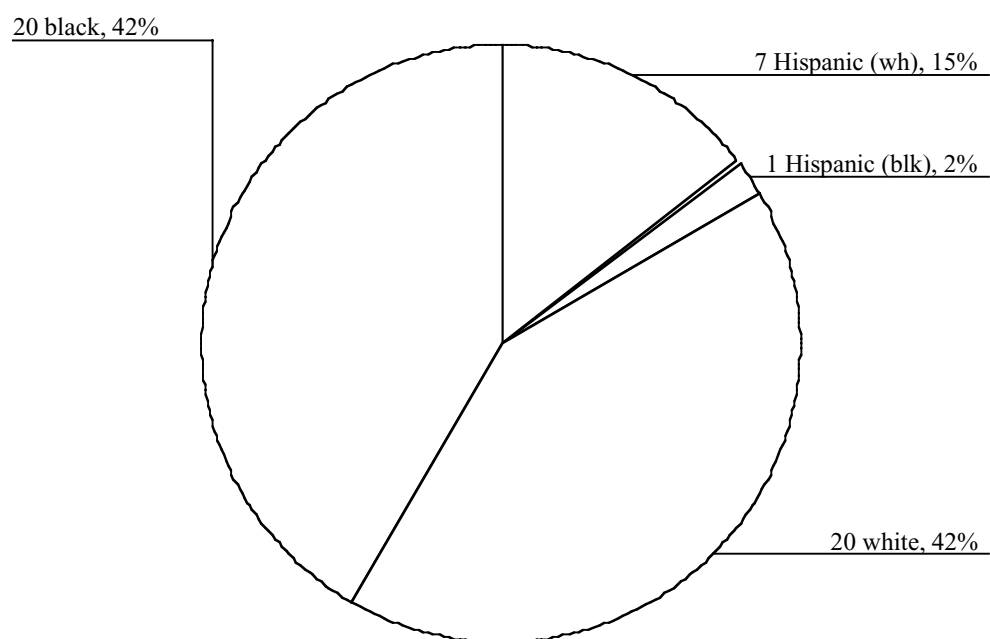


Figure 2.

Ethnicity of Out-Custody Sample.

Results for three year period. Seventeen of the 45 inmates in this group had a decrease in BMI, two remained the same, and 26 had an increase in BMI. The BMI change for 1996-1998 ranged from a decrease of 5.7 to an increase of 5.0 with a mean

increase of 0.3. When the mean 1996 BMIs were compared to the 1998 BMIs using a paired t-test ($t=0.90$) the p value was 0.38.

Results for the period of incarceration (mean 5.8 years). The BMI change over the total period of incarceration ranged from a decrease of 4.8 to an increase of 5.0 with a mean increase of .6. Over the length of incarceration, 16 of the 48 inmates experienced a decrease in BMI, two remained unchanged, and 30 experienced an increase in BMI. Admission BMIs were compared to the 1998 BMIs using a paired t-test ($t=1.90$, $p=0.06$).

Table 2.

BMIs of Sample Inmates, by Custody Levels, on Admission, 1996 and 1998.

	Admission		1996		1998	
Custody Level	In	Out	In	Out	In	Out
<u>n</u>	50	48	37	45	49	48
BMI range	20.1-46.6	18.6-49.8	20.1-50.0	18.6-47.8	21.1-52.5	20.1-50.8
BMI mean	28.2	28.0	29.2	28.5	29.1	28.6
<u>Number (Percent)</u>						
Underweight	0	0	0	0	0	0
Normal weight	21 (42)	21(44)	11 (30)	19 (42)	13 (27)	17 (36)
Overweight	12 (24)	12 (25)	14 (38)	9 (20)	20 (41)	14 (29)
Obese	17 (34)	15 (31)	12 (32)	17 (38)	16 (32)	17 (35)

In-Custody Sample

The in-custody sample consisted of 50 inmates. Ethnic breakdown was almost half Hispanic and the other half split between blacks and whites (see Figure 3). Ages ranged from 22 to 51 years with a mean of 38 years. Length of sentence ranged from 48 to life in prison with a mean of 159 months (13.3 years), excluding the three life sentences. Length of incarceration ranged from 3 to 13 years with a mean of 4.9 years (59 months). In-custody inmates had admission BMIs ranging from 20.1 to 46.6 with a mean of 28.2 (see Table 2). The mean BMI increased steadily over the period of incarceration. The in-custody group was 42 percent normal weight on admission and decreased by 15 percent over the period of incarceration, with the greatest decrease being between admission and 1996. The percentage of overweight inmates increased with a net gain of 17 percent. The percentage of obese decreased from 34 percent to 32 percent between admission and 1996 and remained unchanged in 1998.

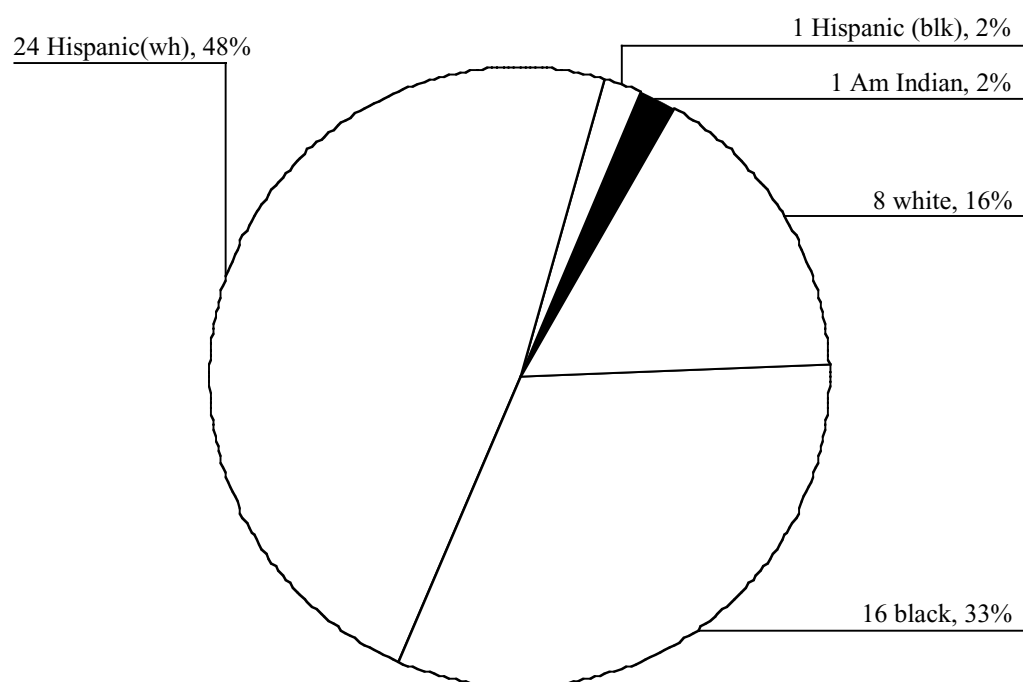


Figure 3.

Ethnicity of In-Custody Sample.

Results for three-year period. The BMI change for 1996-1998 ranged from a decrease of 6.1 to an increase of 4.5 with a mean increase of .7. Nine of the total 36 inmates had a decrease in BMI, one remained unchanged and 26 inmates had an increase in BMI. Using a paired t-test ($t = 2.05$), the difference between the mean BMIs for 1996 and 1998 was significant at the 0.05 level.

Results for the period of incarceration (mean 4.9 years). The BMI change over the period of incarceration ranged from a decrease of 6.1 to an increase of 8.2 with a mean increase of 1.0. Of the 49 inmates, 15 experienced a decrease in BMI, two remained the same, and 32 experienced an increase in BMI. When admission BMIs were compared to the 1998 BMIs using a paired t-test 1998 BMIs were significantly higher ($t = 2.20$, $p = 0.03$).

In-Custody Compared to Out-Custody

It was hypothesized that out-custody inmates, with a less restrictive environment, would have less weight increase than in-custody inmates would. The mean increases in BMI from 1996-1998 among out-custody inmates were 0.3 compared to 0.7 among in-custody inmates. Mean BMI increases experienced during the period of incarceration by out-custody inmates was an increase of 0.6 compared to 1.0 experienced by in-custody inmates. The mean BMI increase was statistically significant for in-custody inmates but not for out-custody inmates. The changes in BMI experienced by in-custody and out-custody inmates were compared using a two-tailed t-test for independent samples. There were no significant group differences in BMI changes for either the 1996-1998 period ($t = 0.96$, $p = 0.34$) or the period of incarceration ($t = 0.62$, $p = 0.54$).

Sample by Length of Sentence

Initially 50 months was chosen as an arbitrary division for sentence length. After gathering data, only one inmate had a sentence less than 50 months. The division for sentence length was changed to 100 months, with less than 100 months a shorter sentence and 100 or more months being a longer sentence.

Sample with Longer Sentences

Seventy-three of the total sample 98 inmates had longer sentences, 100 or more months. Ethnic breakdown was relatively even between whites, blacks, and Hispanics (see Figure 4). Ages ranged from 22 to 72 years with a mean of 40 years. Thirty-five inmates were in-custody and 38 were out-custody. Length of sentence ranged from 100 months to life in prison. The average sentence length was 179 months (14.9 years) excluding the three life-sentences. Length of incarceration ranged from 3 to 13 years with a mean of 5.9 years (71 months). Inmates with longer sentences had admission BMIs ranging from 18.6 to 49.8 with a mean of 28.0. The BMI range and mean BMI increased over the period of incarceration (see Table 3).

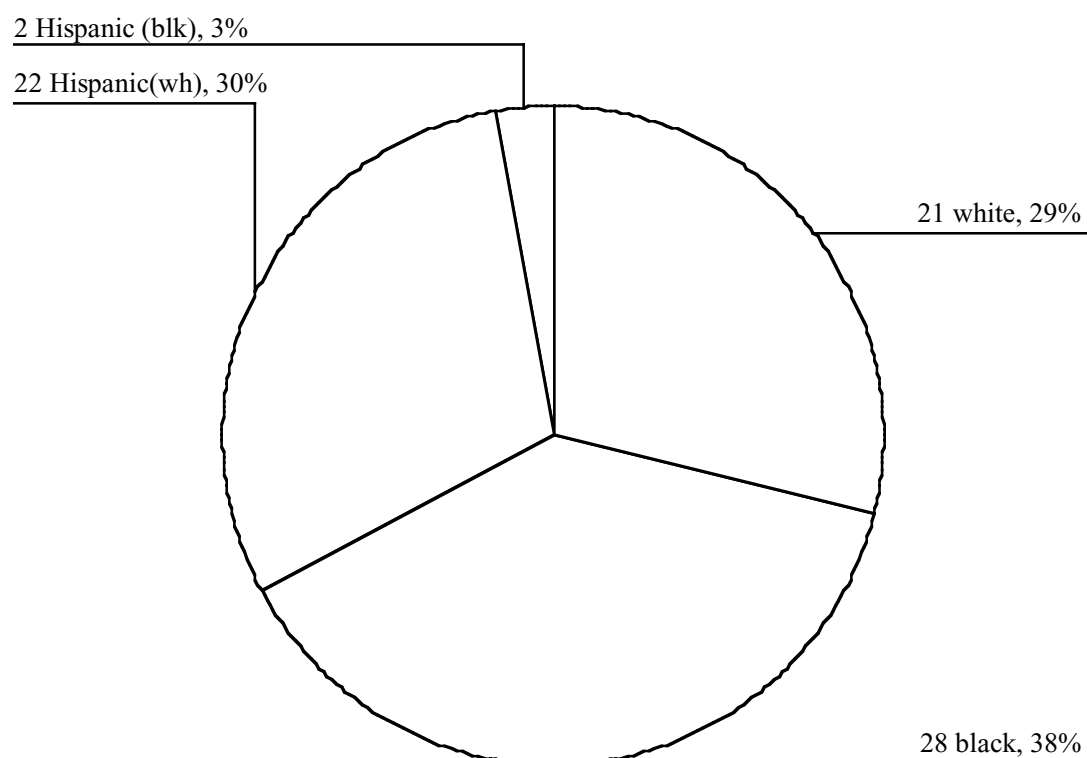


Figure 4.

Ethnicity of Group Sentenced to 100 Months or More.

Results for Three-Year Period. The BMI change for 1996-1998 ranged from a decrease of 5.7 to an increase of 4.5 with a mean increase of .6. Of the 61 inmates, 18 had a decrease in BMI, 3 had no change in BMI, and 40 had an increase in BMI. Twelve charts had weights for 1996 missing. When the 1996 BMIs were compared to the 1998 BMIs using a paired t-test, the 1998 BMIs were significantly higher ($t = 2.52$, $p = 0.02$).

Results for the period of incarceration (mean 5.9 years). The BMI change over the period of incarceration ranged from a decrease of 5.7 to an increase of 8.2 with a mean increase of 1.1. Twenty-two of the 73 inmates experienced a decrease in BMI, while 49 inmates experienced an increase in BMI, and two experienced no change. When the admission BMIs were compared to the 1998 BMIs using a paired t-test, the 1998 BMIs were significantly higher ($t = 3.62$, $p = 0.001$).

Sample with Shorter Sentences

The group with shorter sentences, less than 100 months, had a sample of 25 inmates. Ethnic breakdown is relatively even between whites, blacks, and Hispanics (see Figure 5). Ages ranged from 25 to 64 years with a mean of 39 years. Fifteen inmates were in-custody and ten were out-custody. Length of sentence ranged from 48 to 99 months, with a mean of 73 months (6.1 years). Length of incarceration ranged from 36 to 60 months with a mean of 43 months (3.6 years). Inmates with shorter sentences had admission BMIs ranging from 20.1 to 46.6 with a mean of 28.4 (see Table 3). The BMI range narrowed over the three-year period, 1996-1998 and the mean BMI decreased over the length of incarceration.

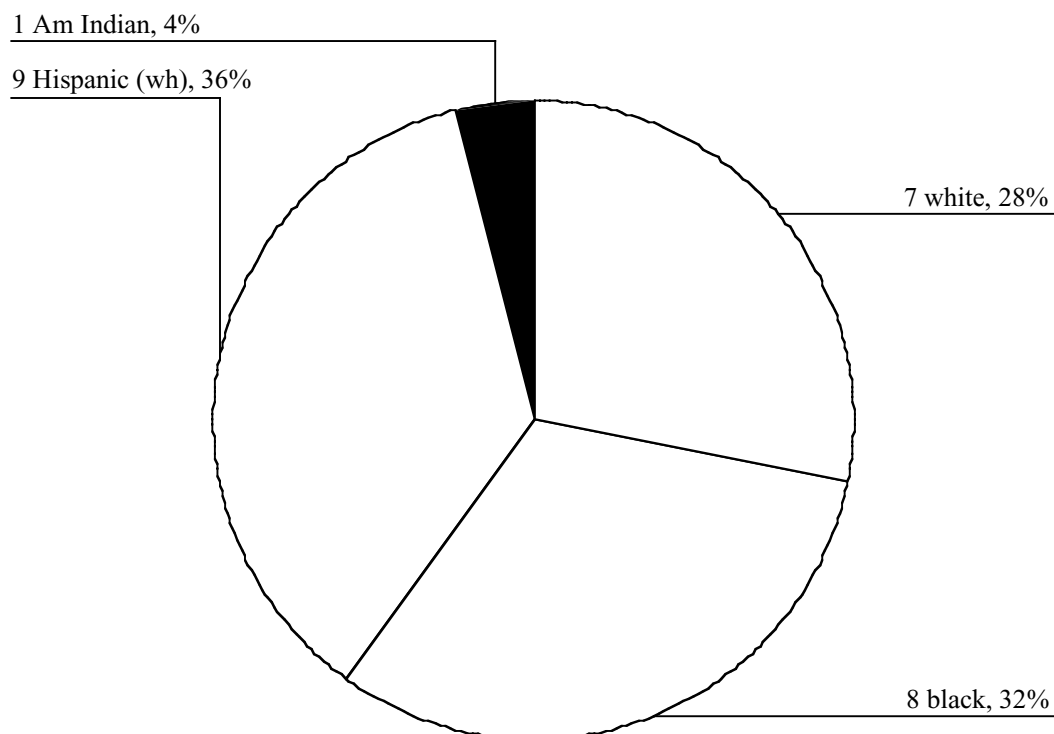


Figure 5.

Ethnicity of Group Sentenced to Less Than 100 Months.

Results for three-year period. Of the 25 inmates with shorter sentences, eight had a decrease in BMI, 12 had an increase and five charts had weights missing. BMI changes for 1996-1998 ranged from a decrease of 6.1 to an increase of 5.0 with a mean decrease of 0.1. The 1996 BMIs when compared to the 1998 BMIs using a paired t-test were not significantly different ($t = 0.04$, $p = 0.97$).

Results for period of incarceration (mean 3.6 years). The BMI change over the period of incarceration ranged from a decrease of 6.1 to an increase of 4.0 with a mean

decrease of 0.2. Nine of the 25 inmates experienced a decrease in BMI, 13 experienced an increase, two experienced no change in BMI, and one had a weight missing. Mean admission and 1998 BMIs were compared using a paired t-test were not significantly different ($t = 0.27$, $p = 0.79$).

Shorter and Longer Sentence Groups Compared

It was hypothesized that inmates facing a longer sentence would have a greater increase in BMI than those facing a shorter sentence. The mean change in BMIs experienced from 1996-1998 by inmates with longer sentences was an increase of 0.6 compared to a mean decrease of 0.1 experienced by inmates with shorter sentences. During the period of incarceration, the mean increase in BMI for inmates with longer sentences almost doubled from 1996-1998 (1.1), and the mean decrease for inmates with shorter sentences did double (0.2). The changes in BMI experienced by inmates with longer and shorter sentences were compared using a two-tailed t-test for independent samples. There were no significant group differences in BMI changes for the 1996-1998 period ($t = 1.13$, $p = 0.26$). In contrast, the BMI changes for the period of incarceration had significant group differences ($t = 2.06$, $p = 0.05$).

The group with shorter sentences had a decrease in the percentage of obese and normal weight individuals and an increase in overweight individuals (see Table 3). The group with longer sentences showed an increase in the percentage of obese and overweight individuals and a decrease in normal weight individuals (see Table 3).

Table 3.**BMI of Sample Inmates by Length of Sentence on Admission, 1996 and 1998.**

	Admission		1996		1998	
Sentence length	<100	_100	<100	_100	<100	_100
in months						
<u>n</u>	25	73	21	61	24	73
BMI range	20.1-46.6	18.6-49.8	20.1-46.6	18.6-50.0	21.1-40.5	20.1-52.5
BMI mean	28.4	28.0	28.3	29.0	28.2	29.1
<u>Number (Percent)</u>						
Underweight	0	0	0	0	0	0
Normal weight	11 (44)	31 (43)	8 (38)	22 (36)	7 (29)	23 (32)
Overweight	4 (16)	20 (27)	6 (29)	17 (28)	9 (38)	25 (34)
Obese	10 (40)	22 (30)	7 (33)	22 (36)	8 (33)	25 (34)

Summary

The sample selection process was explained, and the sample was described. BMI changes for a period of three years and for the period of incarceration were presented. The mean change in BMI increased for all study groups except for the inmates with shorter sentences. Although an overall-increase was reported the changes were not always statistically significant.

Chapter Five contains conclusions, answers to research questions and hypotheses, compares the sample to the general public, and offers recommendations for further study.

CHAPTER V: SUMMARY

Conclusions

Overweight and obesity are on-going health problems in the United States. A BMI greater than 25.0 puts the individual at higher risk for complications such as heart disease, high blood pressure, diabetes and some forms of cancer (NHLBI, 1998b).

Inmates in this sample responded to incarceration differently, one-third lost weight and two-thirds gained weight. The mean BMI increased and the percentage of normal weight individuals decreased over the length of incarceration. Although the findings were not always statistically significant, the shift from normal weight to overweight and obese is clinically significant, increasing risk factors for and contributing to medical conditions such as diabetes, hypertension, heart problems and stroke. Overall, weight continued to increase beyond the three to six months covered by previous studies. These findings are generalizable only to the institutions where the study was conducted.

Research Question One

The degree of weight change experienced by female inmates in the BOP over a three-year period was a statistically significant ($t = 2.05$, $p = 0.04$) mean BMI increase of 0.5. Similar results were also found for the total period of incarceration, which averaged 5.3 years, with a statistically significant ($t = 2.91$, $p = 0.004$) average increase in BMI of 0.8.

Earlier research (Ingram-Fogel, 1991; Shaw et al., 1985) reported weight gain with incarceration over short periods of time. This study found that twice as many inmates gained weight as lost weight with a mean increase in BMI that was statistically

significant. Weight gain is not just a short-term response to incarceration but continues over longer periods of time.

Research Questions Two and Three

The extent of weight change for out-custody female inmates over a three year period was a mean increase of 0.3 or one percent and which was not statistically significant ($t = 0.90$, $p = 0.38$). The BMI change for out-custody females over the period of incarceration was a statistically significant mean increase of .6 ($t = 1.90$, $p = 0.06$).

The extent of BMI change among in-custody female inmates over a three-year period was found to be a statistically significant mean increase of 0.7 or three percent ($t = 2.05$, $p = 0.05$). The BMI change for this group over the period of incarceration was a mean increase of 1.0 or four percent and was statistically significant ($t = 2.20$, $p = 0.03$).

Previous research indicated that female college freshmen gained weight (Hodge et al., 1993; Megan et al., 1994) when initially entering college. One study (Hovell et al., 1985) reported that although female freshmen initially gain weight, they also lose that weight once they enter a less restrictive living environment. Out-custody inmates, in a less restrictive environment, had a mean increase in BMI that was not significant. In-custody inmates, in a more restrictive environment, experienced a mean increase in BMI that was significant. Upon comparing the two custody levels, out-custody have a smaller mean increase than in-custody, but the difference was not significant. Throughout the study, out-custody had higher percentages of normal weight individuals (BMI of 18.5 to 24.9) than in-custody. Although the out-custody group had a smaller percentage of obese

individuals on admission and in 1996, it unexpectedly had a higher percentage of obese individuals in 1998 than the in-custody group.

Research Question Four and Hypothesis One

There was a difference in mean BMI changes of female inmates in out-custody compared to in-custody institutions. Hypothesis One stated inmates would experience less increase in BMI at the out-custody institution than at the in-custody institution. Out-custody inmates did have a smaller increase in BMI than in-custody inmates. However, the difference was not statistically significant for a three-year period ($t = 0.96$, $p = 0.34$) or for the period of incarceration ($t = 0.62$, $p = 0.54$). Although the mean BMI is slightly higher and the percentage of overweight inmates is higher in the in-custody group, the percentage of obese inmates is higher in the out-custody group for 1996 and 1998 (see Table 2).

Research Questions Five and Six

The degree of weight determined by BMI change over a three-year period for female inmates with longer sentences was an average increase of 0.6 or two percent and statistically significant ($t = 2.52$, $p = 0.02$). The BMI change for inmates with longer sentences over the period of incarceration was a mean increase of 1.1 or four percent, and statistically significant ($t = 3.62$, $p = 0.001$).

The degree of BMI change over a three-year period for female inmates with shorter sentences was a mean decrease of 0.1, the only mean decrease among the study groups, and not statistically significant ($t = 0.04$, $p = 0.97$). The BMI change for inmates with shorter sentences over the period of incarceration was a mean decrease of 0.2 or one percent and not statistically significant ($t = 0.27$, $p = 0.79$).

Existing research is inconsistent on the effect of longer sentences and longer time incarcerated on inmates (MacKenzie & Goodstein, 1995; Paulus & Dzindolet, 1993; Ruback, et al., 1986). Inmates with longer sentences had a mean increase in BMI that was significant. Inmates with shorter sentences had mean decreases for 1996-1998 and for the period of incarceration; neither was significant.

Research Question Seven and Hypothesis Two

There was a difference in BMI changes experienced by inmates with longer and shorter sentences. Hypothesis Two stated inmates with shorter sentences would experience less increase in BMI than inmates with longer sentences. The data support this hypothesis as inmates with shorter sentences had a mean decrease in BMI and inmates with longer sentences experienced a mean increase in BMI. The difference in BMI changes between inmates with longer and shorter sentences was not significant for the three-year period ($t = 1.13$, $p = 0.26$) but was significant for the period of incarceration ($t = 2.06$, $p = 0.05$). Data for the three-year period were in general less significant than data for the period of incarceration. This difference might be due to the larger sample size (fewer missing weights) for the period of incarceration or the longer time spent in prison.

Total Sample Compared to General Public

The results of the Third National Health and Nutrition Examination Survey (NHANES III), 1988-1994, National Center for Health Statistics (NCHC, 1998) provides statistics on overweight and obesity in the United States population. Among the general public, 24.7% of women were overweight (BMI 25-29.9), and 24.9% were obese (BMI \geq 30) as documented in the NHANES III (NCHC, 1998; NHLBI, 1998b). The percentage

of overweight and obese female inmates in this study exceeded the percentages in the general public, except for the percentage of overweight women on admission (see Table 4).

Table 4.

BMI of Sample Inmates on Admission, 1996 and 1998 Compared with General Public.

	<u>General Public</u> ¹	<u>Inmates</u>		
		Adm	1996	1998
Normal weight (BMI<25)	50%	43%	37%	31%
Overweight (BMI 25.0-29.9)	25%	24%	28%	35%
Obese (BMI ≥ 30)	25%	33%	35%	34%

¹Percentages from NHANES III (NCHS, 1998)

Age

In the general public, BMI for women and men tends to decrease after the fifth decade and obesity is less frequent after age 70 either due to this decrease or the increased mortality of individuals with increased BMIs and advancing age (NHLBI, 1998b). In this study, at admission, the third and fourth decades had a higher percentage of individuals with BMI ≥ 25 than did the fifth decade. However, by 1998, BMI data followed the progressive trend similar to those seen in NHANES III (NCHS, 1998). (See Table 5). BMI changes for the period of incarceration increased, except during the third

decade, with the greatest increase in the fifth decade, a slowing in the sixth decade and a BMI decrease in the seventh decade (see Figure 6).

Table 5.

Combined Overweight and Obesity Classifications (BMI \geq 25) by Age for Sample Inmates on Admission, 1996 and 1998 Compared with the General Public.

	General Public ¹	Adm	1996	1998
Age	Number (Percent)			
20-29	33%	7 (44)	8 (58)	8 (50)
30-39	47%	21 (57)	19 (73)	22 (61)
40-49	53%	20 (64)	15 (60)	25 (81)
50-59	64%	6 (50)	9 (82)	11 (92)
60-69	64%	1 (100)	1 (100)	1 (100)
70-79	58%	1 (100)	0 (0)	0 (0)
80+	50%	(0)	(0)	(0)

¹Percentages from NHANES III (NCHS, 1998)

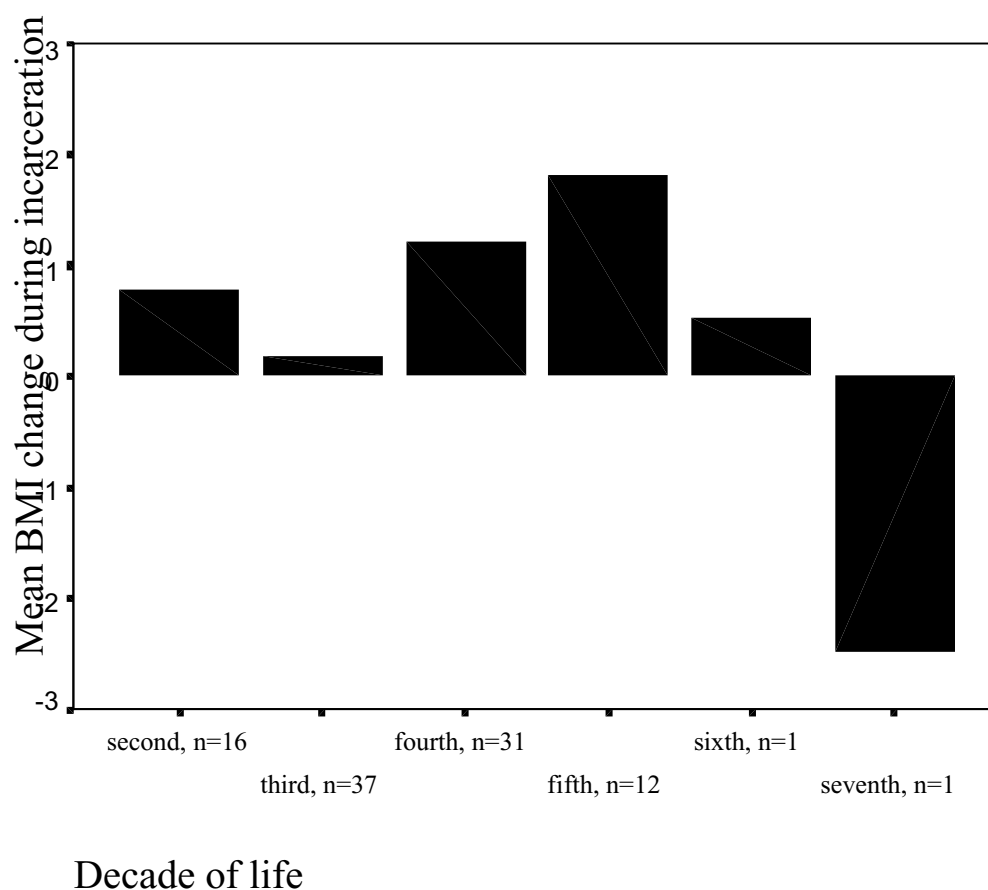


Figure 6.

Mean BMI Change During Incarceration by Decade of Life.

Ethnicity

In the United States, the prevalence of overweight and obesity is higher among minority women than white women (NHLBI, 1998b). The NHANES III (NCHS, 1998) used only ethnic divisions, non-Hispanic white, non-Hispanic black, and Mexican American. For comparison purposes, the white and black Hispanic groups will be combined. BMI levels and changes by ethnicity in this study had some unexpected results (see Table 6). The percentage of normal weight whites dropped by 18% over the

length of the study with the main increase in the overweight category. As BMIs increased, the percentage of white inmates in the normal weight category fell 20% below the percentage in the general public. On admission the black inmates had a higher percentage of normal weight individuals than blacks in the general public. By 1998 there had been a 14% decrease in normal weight blacks with most of the increase shifting to the obese category. Even with these changes, the percentage of normal weight blacks in this sample was higher than the percentage of normal weight whites in 1998. The NHANES III (NCHS, 1998) reported that normal weight blacks were 18.4 percentile points less than normal weight whites among the general public. The Hispanic group showed a progressive increase in the percentage of overweight individuals over the period of incarceration. On admission, the percentage of obese Hispanic inmates was the same as for Hispanics in the general public. By 1998, the Hispanic group had a smaller percentage of obese members than the white group contrary to the trends reported in NHANES III (NCHS, 1998). Unexpectedly, the percentage of obese Hispanics progressively decreased over the period of incarceration, even though 77% had longer sentences and 81% were in-custody. White Hispanics were the only ethnic group to show a weight loss (negative mean BMI change) over the period of incarceration (see Figure 7).

The charts of black and Hispanic inmates accounted for all the missing weights found in this study. This could be related to mistrust or under usage of medical services by these groups, or a difference in care provided.

Table 6.

BMI of Sample Inmates by Race/Ethnicity at Admission, 1996 and 1998 Compared with the General Public.

Race/Ethnicity and <u>n</u>	General Public ¹	Adm 97	1996 81	1998 96
Weight Classifications		Number (Percent)		
White, non-Hispanic		n = 28	n = 28	n = 28
Normal weight	53	14 (50)	12 (43)	9 (32)
Overweight	25	5 (18)	5 (18)	9 (32)
Obese	23	9 (32)	11(39)	10 (36)
Black, non-Hispanic		n = 36	n = 30	n = 36
Normal weight	34	17 (47)	10 (33)	12 (33)
Overweight	29	7 (20)	8 (27)	9 (25)
Obese	37	12 (33)	12 (40)	15 (42)
Hispanic		n = 33	n = 23	n = 32
Normal weight	34	10 (30)	7 (30)	8 (25)
Overweight	33	12 (37)	10 (44)	16 (50)
Obese	33	11 (33)	6 (26)	8 (25)

¹Percentages from NHANES III (NCHS, 1998)

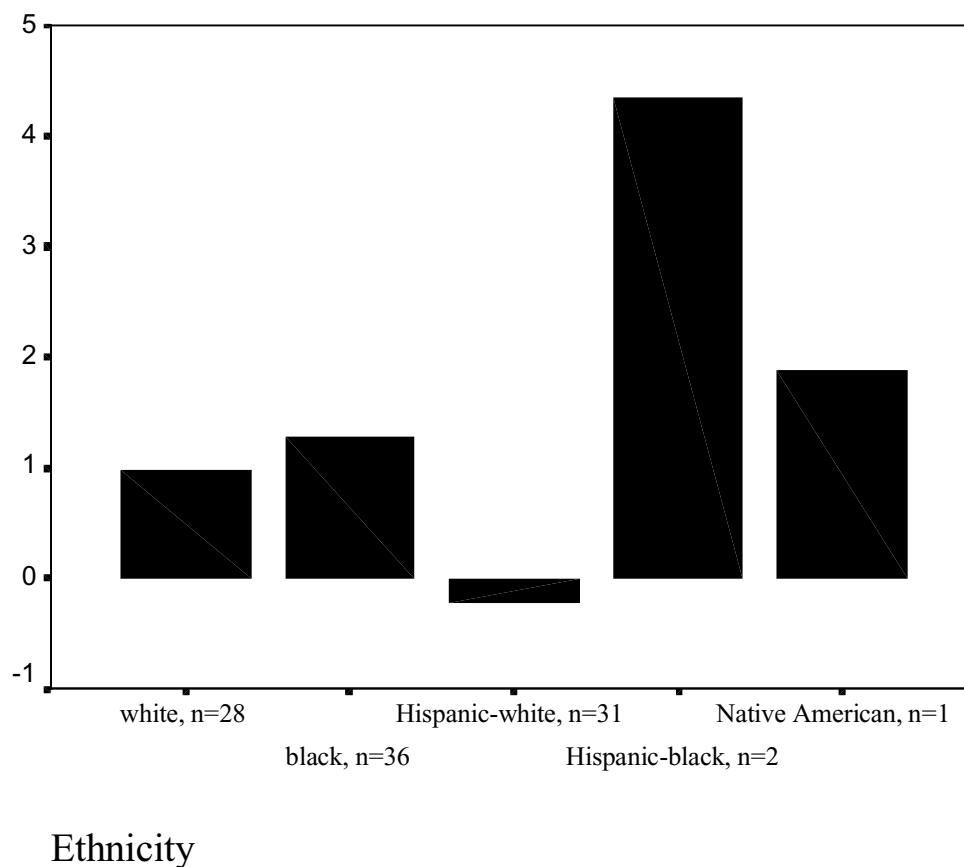


Figure 7.

Mean BMI Change During Incarceration by Ethnicity.

Study Groups Compared to General Public by Ethnicity

The changes in BMI and subsequently the percentages of overweight and obese individuals among ethnic groups vary within the study groups.

Out-Custody Group

Among the out-custody group on admission, the white group had the highest percentage of normal weight, the Hispanic group had the highest percentage of overweight, and the black group had the highest percentage of obese individuals (see Table 7). By 1998, blacks had the highest percentage of obese and Hispanics had the

highest percentage of normal weight and overweight individuals. Out-custody white inmates shifted from normal to overweight and obese, with the greatest increase in the overweight group. Out-custody black inmates shifted from normal weight to overweight and obese, with the greatest increase in the obese category.

Table 7.**BMI of Out-Custody Inmates by Race/Ethnicity on Admission, 1996 and 1998.**

Race/Ethnicity and <u>n</u>	Adm 48	1996 45	1998 48
Weight Classifications	Number (Percent)		
White, non-Hispanic	n = 20	n = 20	n = 20
Normal weight	10 (50)	10 (50)	7 (35)
Overweight	4 (20)	2 (10)	6 (30)
Obese	6 (30)	8 (40)	7 (35)
Black, non-Hispanic	n = 20	n = 18	n = 20
Normal weight	9 (45)	6 (33)	7 (35)
Overweight	4 (20)	4 (32)	5 (25)
Obese	7 (35)	8 (45)	8 (40)
Hispanic	n = 8	n = 7	n = 8
Normal weight	2 (25)	3 (43)	3 (38)
Overweight	4 (50)	3 (43)	3 (38)
Obese	2 (25)	1 (14)	2 (25)

In-Custody Group

Within the in-custody group on admission, the black and white group shared the highest percentage of normal weight individuals, the Hispanic group had the highest percentage of overweight, and the white group had the highest percentage of obese (see Table 8). By 1998, blacks had the highest percentage of normal and obese individuals and Hispanics had the highest percentage of overweight individuals. In-custody whites shifted from normal weight to overweight. In-custody blacks shifted from normal weight to overweight and obese, with the greatest increase in the obese group. In-custody Hispanics shifted from normal weight and obese to the overweight category.

Group with Shorter Sentences

Among the inmates with shorter sentences (< 100 months) on admission, whites had the highest percentage of normal weight individuals, Hispanics had the highest percentage of overweight individuals, and blacks had the highest percentage of obese individuals (see Table 9). White inmates with shorter sentences had percentiles that remained stable throughout the length of incarceration. Blacks showed an increase in the percentage of overweight but no change in the percentage of obese. Hispanics showed a decrease in the percentage of normal weight and obese individuals and an increase in the percentage of overweight. Black inmates with shorter sentences had a shift from normal weight to overweight, with obese percentiles unchanged. Hispanic inmates with shorter sentences had a shift from normal weight and obese to overweight percentiles.

Table 8.**BMI of In-Custody Inmates by Race/Ethnicity on Admission, in 1996 and 1998.**

Race/Ethnicity and <u>n</u>	Adm 49	1996 36	1998 48
Weight Classifications	Number (Percent)		
White, non-Hispanic	n = 8	n = 8	n = 8
Normal weight	4 (50)	2 (25)	2 (25)
Overweight	1 (13)	3 (38)	3 (38)
Obese	3 (37)	3 (38)	3 (38)
Black, non-Hispanic	n = 16	n = 12	n = 16
Normal weight	8 (50)	4 (33)	5 (31)
Overweight	3 (19)	4 (33)	4 (25)
Obese	5 (31)	4 (33)	7 (44)
Hispanic	n = 25	n = 16	n = 24
Normal weight	8 (32)	4 (25)	5 (21)
Overweight	8 (32)	7 (44)	13 (54)
Obese	9 (36)	5 (31)	6 (25)

Group with Longer Sentences

Within the inmate group with longer sentences (≥ 100 months) on admission, the black group had the highest percentage of normal weight individuals and the Hispanic group had the highest percentage of overweight and obese individuals (see Table 10). By 1998 blacks had the highest percentage of normal weight and obese individuals and whites had the highest percentage of overweight individuals. White inmates with longer sentences shifted from normal weight to overweight and obese, with the greatest increase in overweight. Black inmates with longer sentences shifted from normal weight to overweight and obese, with the greatest increase in the obese category. Hispanic inmates, with longer sentences, shifted from obese to normal weight with overweight percentiles unchanged.

Table 9.

BMI of Inmates with Shorter Sentences by Race/Ethnicity on Admission, 1996 and 1998.

Race/Ethnicity and <u>n</u>	Adm 24	1996 20	1998 23
Weight Classifications	Number (Percent)		
White, non-Hispanic	n = 7	n = 7	n = 7
Normal weight	4 (57)	4 (57)	4 (57)
Overweight	0 (0)	0 (0)	0 (0)
Obese	3 (43)	3 (43)	3 (43)
Black, non-Hispanic	n = 8	n = 6	n = 8
Normal weight	3 (38)	2 (33)	2 (25)
Overweight	1 (13)	1 (17)	2 (25)
Obese	4 (50)	3 (50)	4 (50)
Hispanic	n = 9	n = 7	n = 8
Normal weight	3 (33)	1 (14)	0 (0)
Overweight	3 (33)	5 (72)	7 (88)
Obese	3 (33)	1 (14)	1 (12)

Table 10.

BMI of Inmates with Longer Sentences by Race/Ethnicity on Admission, 1996 and 1998.

Race/Ethnicity and <u>n</u>	Adm 73	1996 61	1998 73
Weight Classifications	Number (Percent)		
White, non-Hispanic	n = 21	n = 21	n = 21
Normal weight	10 (47)	8 (38)	5 (24)
Overweight	5 (24)	5 (24)	9 (43)
Obese	6 (29)	8 (38)	7 (33)
Black, non-Hispanic	n = 28	n = 24	n = 28
Normal weight	14 (50)	8 (33)	10 (36)
Overweight	6 (21)	7 (29)	7 (25)
Obese	8 (29)	9 (38)	11 (39)
Hispanic	n = 24	n = 16	n = 24
Normal weight	7 (29)	6 (38)	8 (33)
Overweight	9 (38)	5 (31)	9 (38)
Obese	8 (33)	5 (31)	7 (29)

Recommendations

Body mass index is a widely accepted measurement of overweight, obesity and body fat (NHLBI, 1998b). BMI is easily calculated from height and weight measurements, which are usually contained in routine records. This study was conducted by record review and there was no control for consistency or accuracy of the measurements. Several charts had missing data. Seventeen charts had weights missing for 1996 and one chart had weight missing for 1998. For this reason, data were more complete and had a larger sample size for the period of incarceration than for the three-year period. Weight on admission to the BOP was used as a baseline; however, it would have been interesting to know the inmates' weights prior to any incarceration, as most inmates had some jail time during their trial.

Sample size was large enough to be representative of the female inmate population at the institutions studied. All out-custody inmates meeting the criteria for this study were included and 56% of in-custody inmates, taking every other chart on the computer printout, were included. The sample was obtained to provide near equal numbers of in-custody and out-custody inmates. This resulted in an unequal division for the sentence groups, with longer sentence group being three times the shorter sentence group. Ethnic distribution may have been affected by the BOP's attempt to incarcerate individuals near their families when possible. This could have resulted in higher numbers of minorities in the study institutions.

Areas for further study might include repeating this study at other female institutions. A prospective study would allow for control of measurements and charting. A majority of BOP inmates are male and BMI changes among male inmates could be

studied. Determining if female inmates perceive their weight as a problem and identifying barriers to maintaining or losing weight could also be studied. It would be interesting to follow BMI changes and medical problems to determine if changes occur in blood pressure, diabetes, heart disease, stroke, cancer, osteoarthritis, or injuries developed or worsened, and if transfer to a higher care (medical) facility was required.

An intervention study might be conducted by assessing inmates on admission for weight and health risk factors, and providing education on obesity and its consequences, and ways to improve health while in prison. Grouping inmates by age, medical history, and possibly ethnic differences, might alter the effectiveness of educational interventions. A study could compare results from the same treatment plan administered to different custody levels, sentence lengths, and different ethnic groups. Another area of study could involve comparing the results of treatment plans tailored to different custody levels, sentence lengths, and ethnic groups. Results might also vary with the frequency of follow-up and reinforcement and a study could compare results from the same treatment plan with different schedules for follow-up and reinforcement.

A study might look at the impact of changing the foods offered, and decreasing serving sizes, or perhaps changing the items available at the commissary (inmate's store), although the chances of such a study gaining BOP approval might be problematic. A study looking at BMI changes and employment, family life, and health after release from prison might also be done.

Implications

Overweight and obesity are problems among female inmates beyond the initial three to six months of incarceration. This study illustrates a need for addressing weight

among female BOP inmates. Fifty percent of American women are overweight or obese. On admission to prison 57 percent of the sampled female inmates were overweight and by 1998, the percentage had increased to 69 percent. This weight gain places female inmates at increased risk for the medical problems associated with obesity. Treatment of overweight and obesity involves prevention and management, with prevention being as important as management. Prevention includes keeping individuals from becoming overweight, helping those who have lost weight maintain that loss, and preventing further increases in people who are unable to lose weight (NHBLI, 1998b).

Prevention efforts with female inmates could begin on admission and include assessment of risk factors, education on obesity and consequences, and ways to insure health while in prison. Inmates with existing obesity could be identified and treatment plans initiated. Frequent follow-up and reinforcement might improve results. Changes experienced by custody level, sentence length, age and ethnicity were varied and could be used to target high-risk groups and guide development of interventions for specific groups.

Nursing has a long history of teaching and empowering clients. This expertise needs to be used in correctional nursing when dealing with overweight female inmates. Intervening to assist female inmates in achieving or maintaining normal weight (BMI of 18.5 to 24.9) could impact their health and their ability to care for self, to work, and to resume roles on release.

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APPENDICES

Appendix A	Security Classification for Female Inmates
Appendix B	Custody Level Classification for Female Inmates
Appendix C	Letter from C. J. Durkee, Chief, Budget Executive Branch, BOP
Appendix D	Data Collection Form
Appendix E	USUHS IRB Approval Letter
Appendix F	BOP Institution Approval Memorandum
Appendix G	BOP Regional Office Approval Memorandum
Appendix H	BOP Central Office Approval Memorandum

APPENDIX A

Security Designation Table (Females)

Federal Bureau of Prisons (May 1997). Inmate and Custodial Management, PS 5100.06, Chapter 6, Security designation and custody classification manual, p. 23.

APPENDIX B

Institutional Placement Scale for Females

Federal Bureau of Prisons (May 1997). Inmate and Custodial Management, PS 5100.06, Chapter 6, Security designation and custody classification manual, p. 24.

APPENDIX C

Personal Correspondence from Carol J. Durkee, Chief, Budget Execution Branch

APPENDIX D

Data Collection Form for Weight Changes

Case #	YOB	Ethnicity	MYOI	Cus L	LOS	HT"	Awt
1wt	2wt	3wt	Excluded/comments				

Case #	YOB	Ethnicity	MYOI	Cus L	LOS	HT"	Awt
1wt	2wt	3wt	Excluded/comments				

Case #	YOB	Ethnicity	MYOI	Cus L	LOS	HT"	Awt
1wt	2wt	3wt	Excluded/comments				

Case #	YOB	Ethnicity	MYOI	Cus L	LOS	HT"	Awt
1wt	2wt	3wt	Excluded/comments				

YOB - year of birth

MYOI - month/year of incarceration

Cus L - custody level

LOS - length of sentence

Awt - admission weight

1wt - weight in 1996

2wt - weight in 1997

3 wt - weight in 1998

APPENDIX E

Uniformed Services University of Health Sciences Institutional Review Board Approval

APPENDIX F

Bureau of Prisons Institution Approval Memorandum

APPENDIX G

Bureau of Prisons Regional Office Approval Memorandum

APPENDIX H

Bureau of Prisons Central Office Approval Memorandum